



# United States Department of the Interior

BUREAU OF LAND MANAGEMENT  
Salt Lake District Office  
2370 South 2300 West  
Salt Lake City, Utah 84119



IN REPLY REFER TO:

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(U-022)

JUL 06 1992

Diane Neilson, Geologist  
Director, Utah Div. of Oil, Gas, and Mining  
355 West North Temple  
3 Triad Center, Suite 350  
Salt Lake City, Utah 84106

Dear Diane,

Thank you for your participation in the last meeting of the Bonneville Salt Flats Technical Review Committee (TRC). The meeting was quite productive and I appreciate the level of concern which you have shown for the salt loss study.

Enclosed is the draft of the minutes for your review. The next meeting of the TRC will be held at 8:30 a.m. on August 10, 1992. If you have any questions regarding TRC issues, please feel free to call Phil Allard at (801) 977-4300.

Sincerely,

Deane H. Zeller  
District Manager

Enclosures  
As stated above

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DIVISION OF  
OIL GAS & MINING

**Minutes of the Technical Review Committee**  
Meeting of June 3, 1992  
Recorded by Philip Allard

**Attendance:**

**Committee Members:**

Paul Anderson (PA)  
Craig Forster (CF)  
Wally Gwynn (WG)  
Jim Kohler (JK)  
Diane Neilson (DN)  
Hugh Coltharp (HC)  
Stanley Plaiser (SP)

**BLM Representatives:**

Phil Allard (PhA)  
Deane Zeller (DZ)

**U.S.G.S. Representatives:**

Lee Case (LC)  
Jim Mason (JM)  
Geoff Freethy (GF)  
Joe Gates (JG)  
George Piper (GP)

**Preliminary Meeting:**

A preliminary meeting was held beginning at 9:30 am. in the BLM conference room at the Salt Lake District Office. The representatives of the U.S.G.S. were not in attendance at the preliminary meeting.

1. The minutes from the meeting of 2/18/92 were read. PA noted a typographic error in Item 18. "1,00" should be changed to "1,000". PA suggested that the following should be added to Item 3 under heading of Post Meeting: "and thinks that the U.S.G.S. should pursue their plan to see what they could come up with." Finally in Item 1 under the heading Main Meeting there is a reference to electric logs and gama ray logs in paragraph 4. This is an error. The geophysical logs run were SP and single point resistivity. The minutes were accepted as revised.

2. PA announced that no written report had been submitted to the TRC prior to the meeting. This makes the preliminary meeting less meaningful. CF stated that he had spoken with JM and that no written material had been prepared. CF felt that there appeared to be chronic understaffing at the U.S.G.S. Should the TRC be making staffing recommendations? DN felt the issue needed to be explored and that there was a need to receive progress reports so that the TRC could adequately perform their duties. CF moved that a member of the committee write a letter to DZ expressing the need for additional reporting and more timely reporting. DN seconded. There was no dissent. It was agreed that CF would prepare the

letter and send it to DZ and that no review of a draft would be needed. (PhA note: because of discussion with LC during the full meeting, I'm not sure that this letter will be pursued.)

#### Full Meeting:

The full meeting began at 10:00 am.

1. U.S.G.S. handed out a written report on their activities and a summary of their proposed activities for the summer. A copy is attached.

2. LC opened with a statement that underlined the U.S.G.S.'s strong desire to support the TRC and the willingness of the U.S.G.S. to supply additional information or data to the TRC. They are very willing to share information and data together with up-to-the-minute interpretations of the data that was collected.

3. JM presented the progress report. Mass water level measurements in the shallow brine aquifer wells were taken. They have not been corrected for density nor have they been contoured. JM passed around a map. Blue dots are shallow brine. Green dots are observation wells. Specific gravity and temperature were taken for each water level measurement. Specific gravity was determined in the field using an hydrometer. Prior to the aquifer test, they developed each observation well using a compressor to jet the wells.

In March a crew from the Hill AFB study came into Pilot Valley. Three cores were collected using a hollow stem auger. The cores were given to CF for analysis of pore fluids.

Pressure transducers and data loggers were installed on the observation wells. Barometric pressure data were collected at the truck stop. The pump was installed 200 feet deep. Pumping started in May. A large amount of pebbles and clay were produced. They pumped for 8 hours. The in-line flow meter jammed with clay and pebbles and was removed. The test began on May 6 at 10:00 am. There were two breaks in the pumping, both very short. These breaks were needed to adjust the pump.

The main problem encountered was with two of the data loggers on observation wells. The data logger on OW 1 near the Silver Island Mountains and OW 4 toward the mud flats failed due to the build up of static electricity because of a storm. OW 2, OW 3, and OW E generated data and should give a value for transmissivity and storage. OW 5 and OW 6 were deepest and showed no response. OW 4 was designed to give vertical permeability. OW 1 showed variable response at different depths. This could have been boundary conditions because of the Silver Island Mountains.

CF asked if the test was to evaluate boundary conditions. JM stated that Ken Kipp in Denver will help make a determination if the test needs to be rerun. JM said that they know a lot more

about the well than they did before. JM has not reduced the data. He does not yet know if they have enough data to generate a number for vertical permeability. The data will be available to determine if they need to rerun the test before winter.

The average rate of pumping was 1,500 gallons per minute based on periodic discharge measurements made with a hof meter. A microbarograph was used to measure barometric pressure. JM discussed some of the resistivity measurements in the wells. DN commented that in OW 1 higher resistivity was described as related to coarser gravel and in OW 4 higher resistivity was related to fresher water. She asked why the difference. JM clarified to say that these were two possible explanations. He said that specific conductance was also taken, but the data had not been completely analyzed. In OW 4 the highest specific conductance (40,000) was recorded in the middle interval in the well. In OW 5 the highest specific conductance was encountered in the upper portion of the well and in OW 6 the highest specific conductance (115,000) was encountered in the lowest portion of the well. JM showed two cross sections to the group which showed the section through the area of the pump test. No samples were collected for chemical analysis.

JM stated that they intend to collect water quality data and measure major anions and cations plus Li, Br, deuterium and stable isotopes of O. Carbonate and bicarbonate data will be collected and alkalinity will be determined.

4. LC explained the review process on aquifer tests. About 15 years ago, in one year 150 transmissivity values were published by the U.S.G.S. Many of these values were not reproducible. Because of this, a review procedure was established. Each aquifer test must be reported in detail. There has to be an explanation of the results that is consistent with the physical system and the numbers. The regional office must review this report before the results of the test can be published. Since this procedure was established 150 published values per year fell to 3 published values per year. The report can be made available to the TRC at the same time that it is sent to the regional office. LC also said that they are having a sampling procedures course to refresh everyone before the summer.

5. GP discussed the progress made with evaluating the pond migration component of the study. On 2/29/92 they did a black and white infrared flight. It is very difficult to identify the pond boundary. At least 3 tenths of a foot of water is needed to see water. 2 tenths of a foot of water could not be seen. On 4/7/92 they went and took cross sections of the pond. The sections were one mile apart. They calculated that there were 784 acre feet of water on the surface at that time. On 4/16/92 the water near the raceway access was gone but there was some water southwest of Floating Island. On 4/24/92 Bil Brothers found that there was no water left.

The logistics of areal photographs make this approach to the study

of pond migration difficult. It takes time to order a flight and it must be cleared through the Air Force. The pond can change dramatically during that time. Using the GPS system they were successful in establishing 95 points to obtain average water depths from which volume could be calculated. CF asked about the use of satellite images. PhA said that the BLM was looking into this possibility.

JM said that a further problem with the ponds is that they can move rapidly. Rather than worry about pond movement they should concentrate on the movement of salt from the flats to the ditch. Is the thin salt crust which forms near the ditch from ponds or from upwelling of local brines? CF suggested that the same measurement problems exist with the thin crust as with the ponds. JM said that you have a period of time when you can look at the thin crust and it is not as ephemeral as are the brines. LC said that they are getting a better insight on the process of salt crust formation. JM said that the key question to answer is how much salt is moved from the salt crust into the area of influence of the ditch. The pond had a density of 1.21 yet the water in the ditch had a density of 1.18 so the water in the ditch is less concentrated than the water in the pond. PA pointed out that measuring the salt crust is going to be difficult because you will have a hard time saying that this salt is from the pond and this other salt is from groundwater. LC said that they should be able to use the chemical signature of the salt to make that determination.

JK asked if the U.S.G.S. had a better handle on pond formation now. JM said that his sense of this now is that the ponds are derived from ground water moving upward. He said that he felt that water is generally rising but the salt is kept dry by evaporation. When evaporation falls off in the later part of the year, the ponds formed. He said that there had not been enough precipitation to account for the pond this winter and that when they were pumping the test well at 1,500 gallons per minute they were unable to generate a large pond; all the water infiltrated rapidly. GP pointed out that this fall there was a large rain storm in the Silver Island Mountains, but at the break in slope there was not any evidence of runoff.

6. JM said that their near term plans include making density corrections on the mass water level measurements and plotting the potentiometric surface. This summer they plan to make an additional mass water level measurement. They also plan to complete additional shallow wells on the southern end of the area. This will be coordinated with Reilley. They will also collect data in Pilot Valley. They are hiring an additional temporary employee. Blair Jones will help design data collection for the chemical data.

7. There will be a meeting with Blair Jones at the W.R.D. office on Friday June 5, 1992, to discuss the geochemistry of the salt. They plan to collect cores directly below the salt crust and look at the Br:Cl ratio. If the ratio decreases with depth (increasing Cl),



precipitation of salt at the base of the crust is indicated. If the ratio increases with depth (decreasing Cl) dissolution of salt at the base of the crust is indicated. Several cores will be taken. If W.R.D.'s auger is not capable then a crew will be brought in. There is a professor at the University of Wisconsin who is interested in clay diagenesis. A researcher in Calgary is interested in looking at the fluid inclusions in the salt crust if a core could be obtained.

8. A number of shallow wells will be sampled to look at the data that Lines collected. The same wells will be used as were used by Lines to see what kind of changes may have happened over time.

9. Ken Kipp will be conducting some preliminary modeling based on existing data. This preliminary modeling could be available as early as the end of July and will be used to guide the collection of additional data to make the modeling more accurate. The additional wells planned at this time will be completed before Kipp has done the modeling. This is because of the availability of the drilling crew. If more wells are needed for the model, then a new crew will be brought in toward the end of the summer.

10. PA said that Brent Bingham was to present the Salt Replacement Study but that he couldn't make it today. HC said that he would just as soon have the presentation later after the TRC could look over the report. SP said that a little more information would be helpful in reviewing the report. He said that he would check to see if it was available. PhA said that the news media had asked for a copy. HC said that the news should be put in touch with either Rick Vesco or Reilley if they wanted a copy. The TRC meetings are open to the public unless they are specifically closed. Reilley may not wish to have the feasibility report made public at this time.

11. It was decided that the next meeting would be held on August 10, 1992 and start at 8:30 in the morning. LC said that they would have the quarterly report available by the end of July. JM said that he expected to have information on the pump test analysis, preliminary modeling, and specific gravity with water levels available for the August meeting.

12. With no further business the full meeting adjourned at 11:45.

#### Post Meeting

1. SP felt he still had concerns regarding the quality of the data collected during drilling, particularly on the lithology near the site of the pump test. He said that he would try to get over to the U.S.G.S. and review the data before July so that if the TRC needed to make a recommendation regarding further drilling this could be done before the drilling crew arrived.

2. DN said that she was concerned that the interpretations of the data were still tentative. She suggested that more thorough



analysis of the geophysical logs from drilling might yield more complete interpretations. CF suggested that it might be possible to use an additional core hole to more carefully correlate lithology to geophysical logs and then get more information from the existing logs. SP suggested that an interval sampler might be a more effective tool than a continuous core barrel.

3. It was decided that the next meeting would be closed to the public.

4. The meeting adjourned at 12:05 pm.

PROGRESS AND PLANS FOR BONNEVILLE SALT FLATS STUDY  
JUNE 3, 1992

PROGRESS:

Mass water-level measurements were made on wells completed in the shallow-brine during March. These values have been plotted on GIS coverage for contouring. Water levels need to be corrected for density before a corrected potentiometric surface can be drawn.

Deep observation wells in the vicinity of unused production well were developed in preparation for alluvial-fan aquifer test. Protective surface casings were cemented into place.

A 100-foot observation well was completed on the west margin of the Pilot Valley playa. Three cores were obtained for pore-fluid extraction and analysis. These data will aid in the understanding of the hydrologic system in Pilot Valley.

A 72-hour aquifer test was completed during the second week in May. The test was designed to obtain estimates for hydraulic properties of the alluvial-fan aquifer and the overlying clays. Numerous problems were encountered during the test. The well was not developed after drilling or because of the lack of use, the water level in the well fluctuated during pumping. The well was pumped for 8 hours prior to the test with a considerable amount of pebbles and clay in the discharge water. Problems with the data loggers resulted in the loss of data from nested piezometers OW-1 and OW-4. Data were obtained from wells OW-2, OW-3, OW-E, and the deep piezometers in OW-5 and OW-6. Data from OW-5 and OW-6 show no response. With data obtained from functioning data loggers, values for transmissivity and storage for the alluvial-fan aquifer can be obtained. Interpretation of data is required before an estimate for vertical hydraulic conductivity of the overlying clays can be determined. If the existing data are determined to be insufficient to meet the needs of the project, a second aquifer test will be conducted.



A set of black and white IR photos were obtained of the surface ponds on the Bonnevie Salt Flats in early spring. Problems with this procedure for interpretation of pond movement include difficulty in determining actual pond boundary and speed with which ponds migrate and the preparation time required to make a flight.

PLANS:

Make density corrections for water-level data and construct potentiometric-surface maps. Measure water levels in mid-summer and produce potentiometric-surface maps.

Drill additional monitoring wells in Pilot Valley and collect data.

Drill additional monitoring wells along I-80 prior water-level measurements in mid-summer.

Collect cores directly beneath salt crust for geochemical interpretations.

Collect water samples from selected wells on the Bonneville Salt Flats and Pilot Valley for chemical analysis.

Preliminary modeling will be completed by the end of July in order to identify any additional data requirements before the end of the field season.